

Developing International GHG Emission Reduction Projects Using AFV Technologies

Jette Findsen

Science Applications International Corporation (SAIC)

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Overview of Session

Benefits to AFV Industry

Market Based System for GHG Reductions

Co-operative Projects

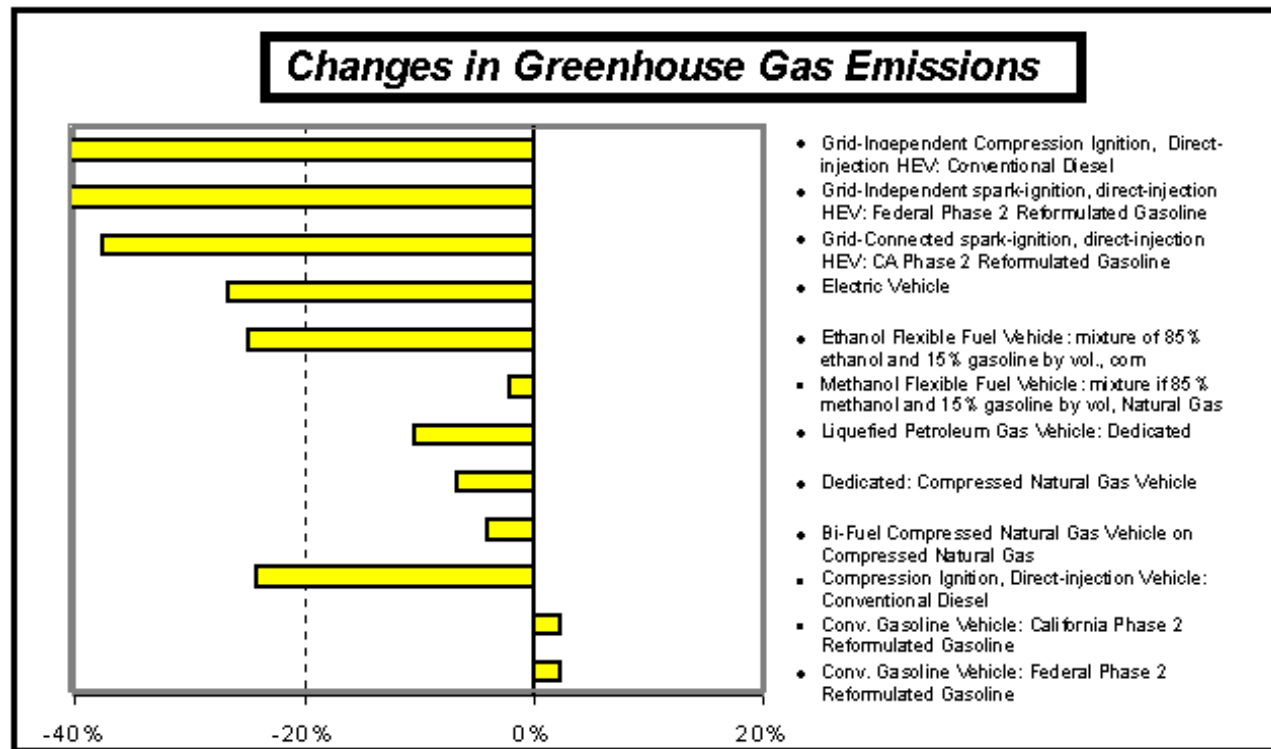
Baseline Development

Electric Vehicle Case Study



Why Get Involved in GHG Reduction Projects?

- Significant potential for reducing GHG emissions

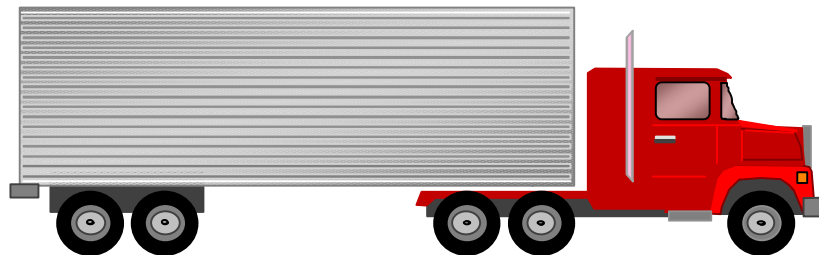
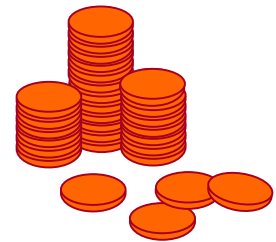


Source: Michael Wang, ANL, GREET Model



Benefits to AFV Industry

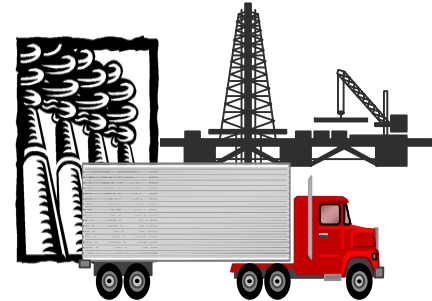
- Growing value of GHG credits
- Improve economics of AFV projects
- Influence development of market-based framework for GHG control
- Technology Transfer



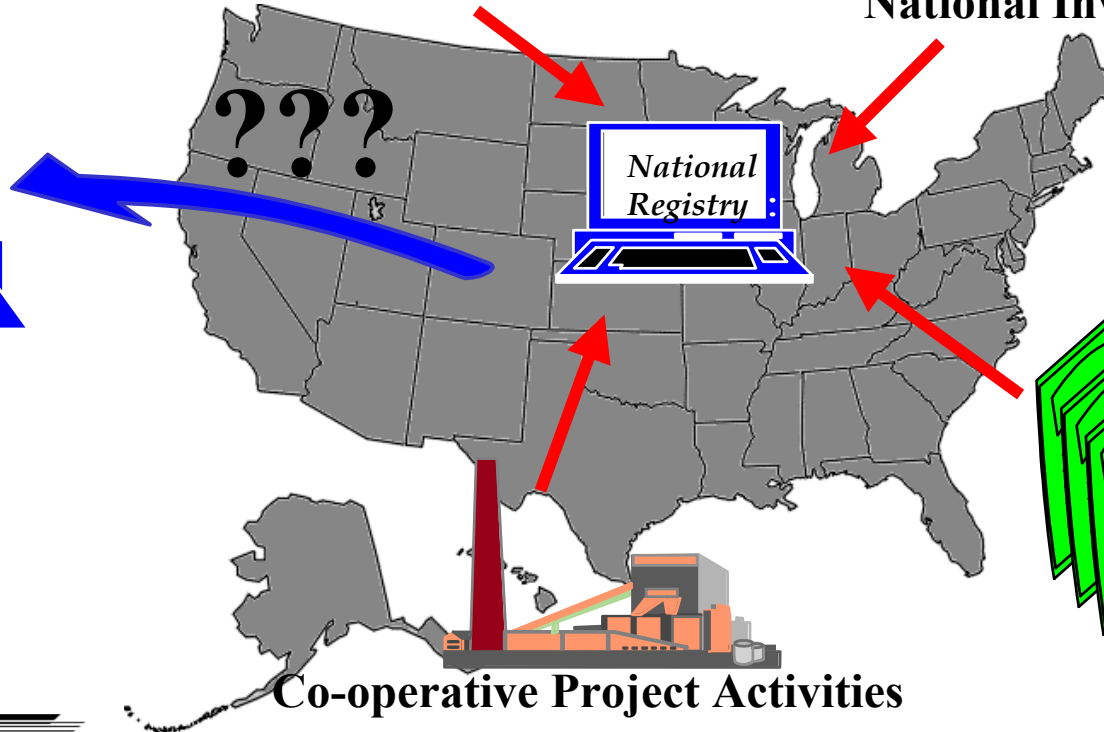
A Market Based System



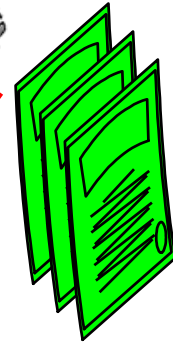
Emissions Trading



National Inventory

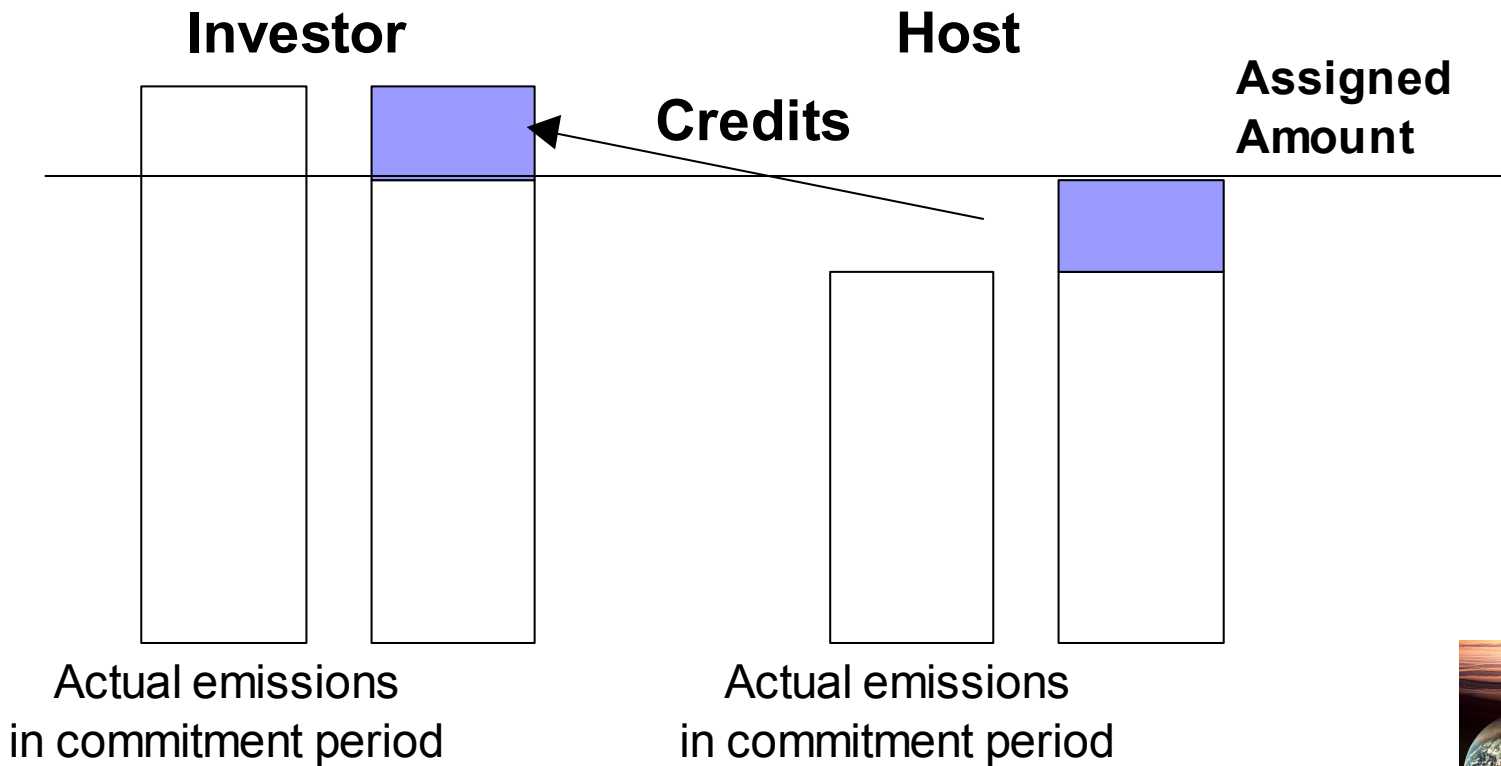


Domestic Policies and Measures



Co-operative Project Activities

Earned Credit Transfer from Host to Investor

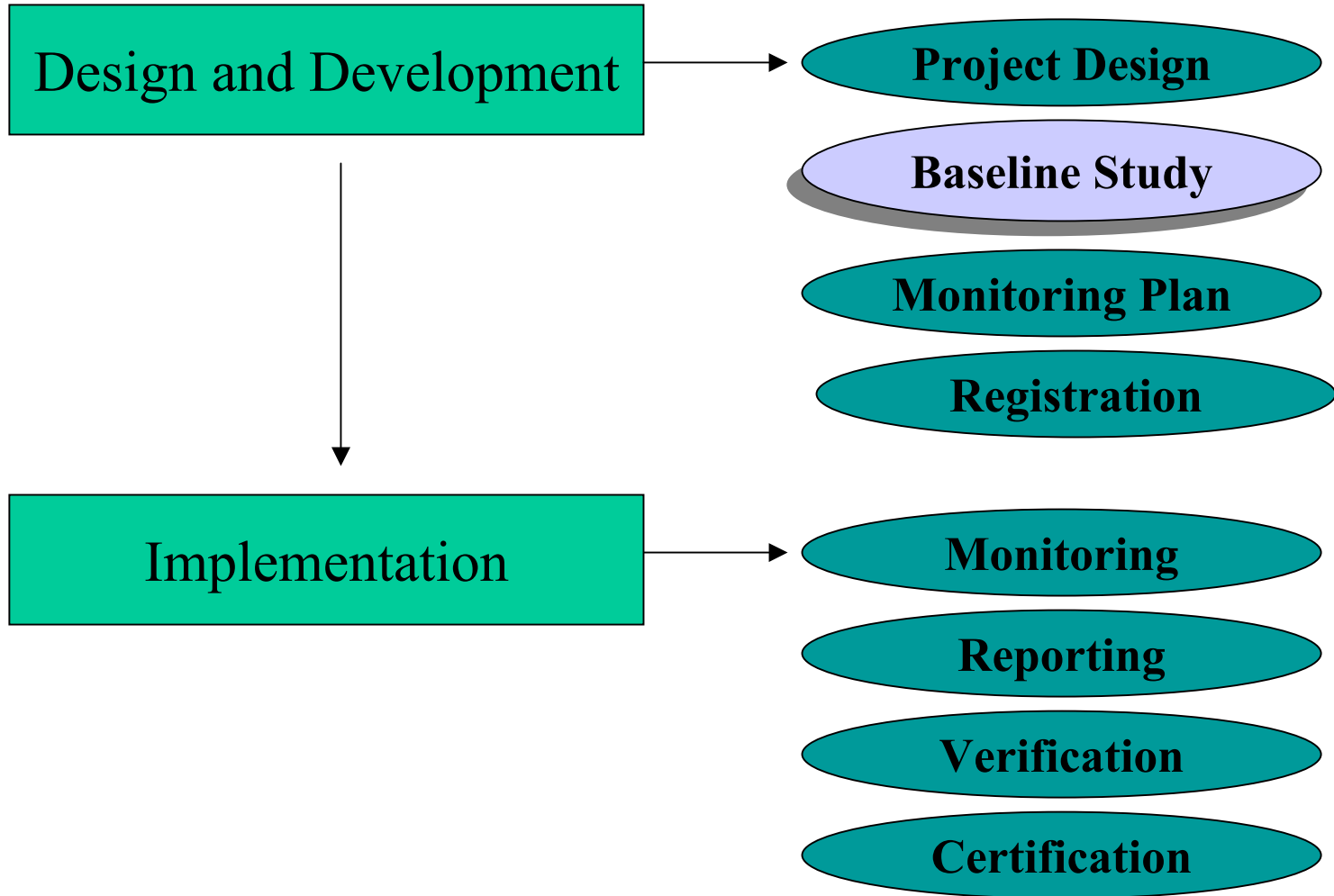


Co-operative Project Types: Transport Sector

- Change vehicle fuel efficiency
- Change vehicle fuel type
- Switch transport mode
- Reduce transport activity
- Increase load factor

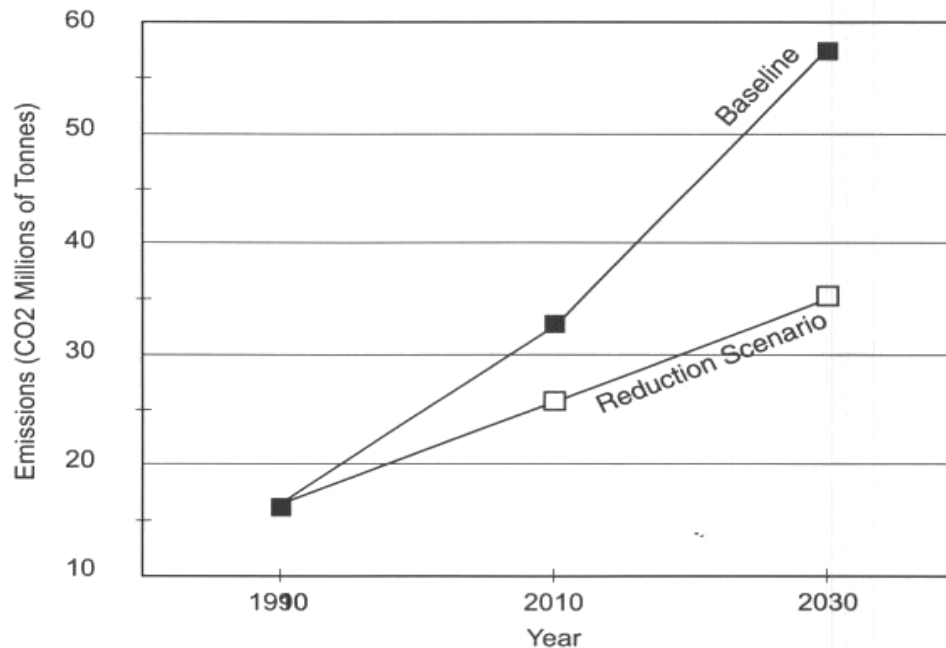


Project Development Steps



The Emissions Baseline

- Measure for estimating GHG emission benefits
- Ensures environmental benefit of project

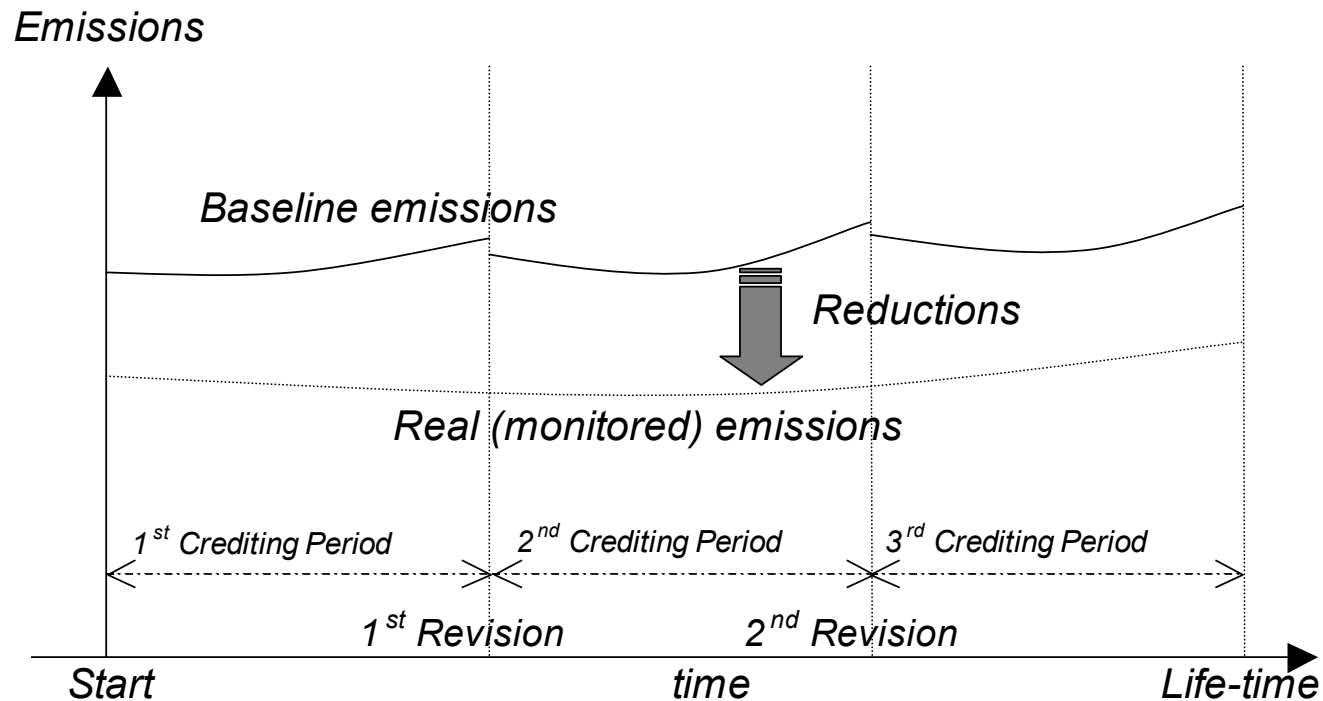


Step by Step Approach to Baseline Development

- Describe the project
 - current situation/problem
- Verify project “additionality”
- Describe baseline characteristics
- Quantify GHG baseline emissions
- Quantify project GHG emissions
- Estimate reduction impact



What Do We Mean by “Additionality” ?

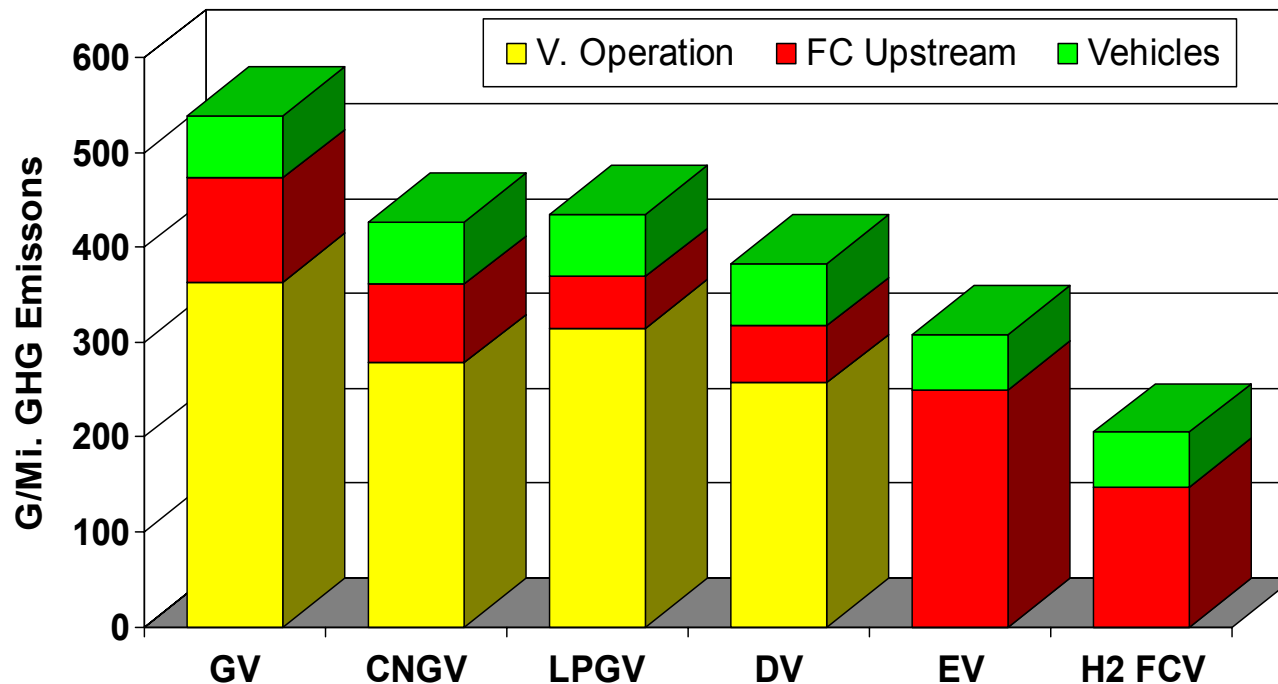


Source: Naoki Matsuo, 2000



Baseline Characteristics: Project Boundary

- Life cycle versus tail pipe emissions analysis
 - Upstream emissions can make a difference when comparing vehicle/fuel systems

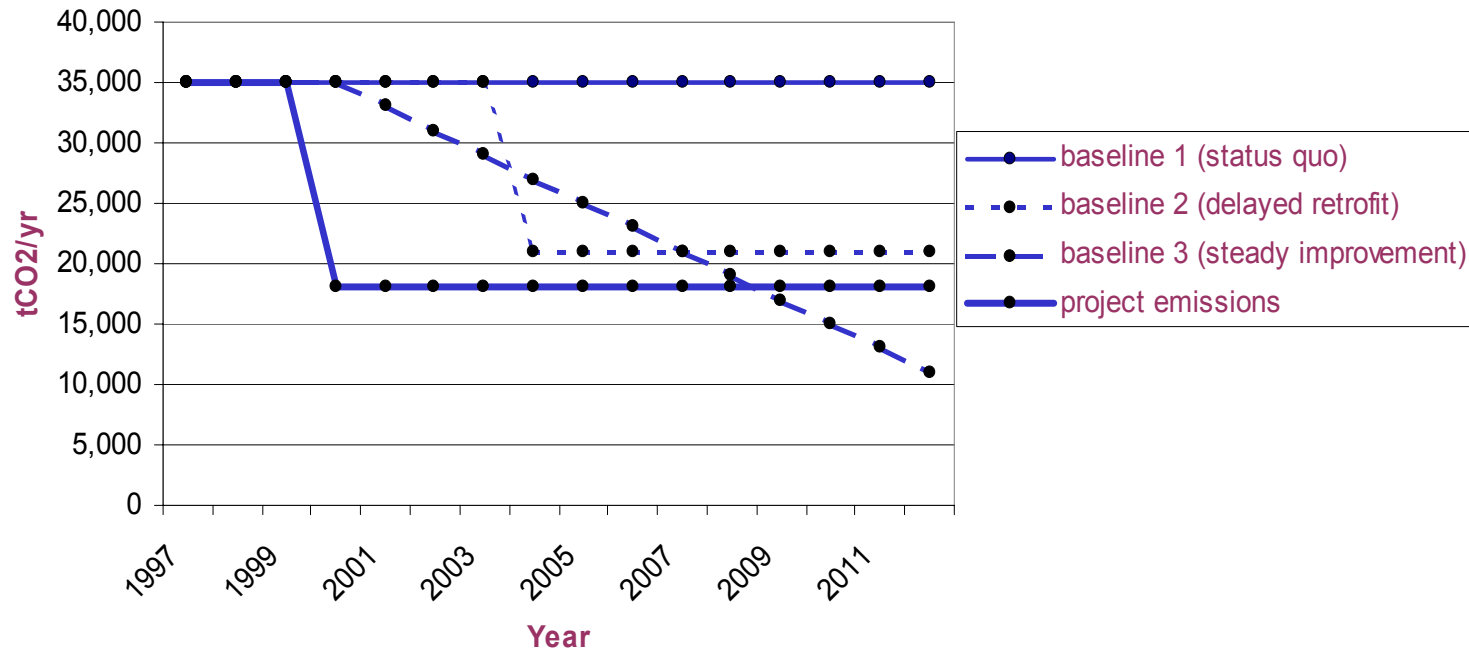


Source: Michael Wang, LBNL, GREET Model



Baseline Characteristics: Sample Types

Comparison of Project Emissions Against Alternative Baselines



	<i>Baseline 1</i>	<i>Baseline 2</i>	<i>Baseline 3</i>	<i>Project Emissions</i>
<i>cumulative emissions</i>	455,000	329,000	299,000	234,000
<i>total credit</i>	221,000	95,000	65,000	-



Baseline Characteristics: Relevant GHGs

- Major Greenhouse gases:
 - Carbon dioxide (CO₂)
 - Methane (CH₄)
 - Nitrous Oxide (N₂O)
- Global Warming Potential (GWP)
 - CO₂ = 1; CH₄ = 21; N₂O = 310
- Total CO₂-equivalent emissions:

$$\text{CO}_2\text{-equiv} = 1 \times (\text{mass of CO}_2) + 21 \times (\text{mass of CH}_4) + 310 \times (\text{mass of N}_2\text{O})$$



Quantify GHG Benefits

1. Estimate baseline
2. Determine project emissions
3. $\text{Baseline} - \text{project emissions} = \text{net benefits}$



Baseline Characteristics: Possible Estimation Procedures

- Tailpipe evaluation
 - (miles per year) x (grams per mile)
 - (fuel use) x (fuel carbon)
 - add methane penalty
- Full fuel cycle evaluation
 - Production, processing, transportation of fuel
+ operation of vehicle



Baseline Characteristics: Data Availability

- For U.S. projects use GREET
 - The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model
 - Argonne National Laboratory
www.transportation.anl.gov/ttrdc/greet/
- Other countries
 - Limited availability



Electric Vehicle Case Study

- Hypothetical
- 125 EVs to replace 125 gasoline vehicles
- 3 scenarios:
 - Static baseline, comparing fuel usage
 - Modified baseline, comparing fuel usage
 - Static baseline, analyzing full fuel cycle



Case Study: Comparing Fuel Usage

Emissions = (miles/fuel efficiency)

x (emission factor of fuel)

x (number of vehicles)

x (number of project years)

Net Project Benefits =

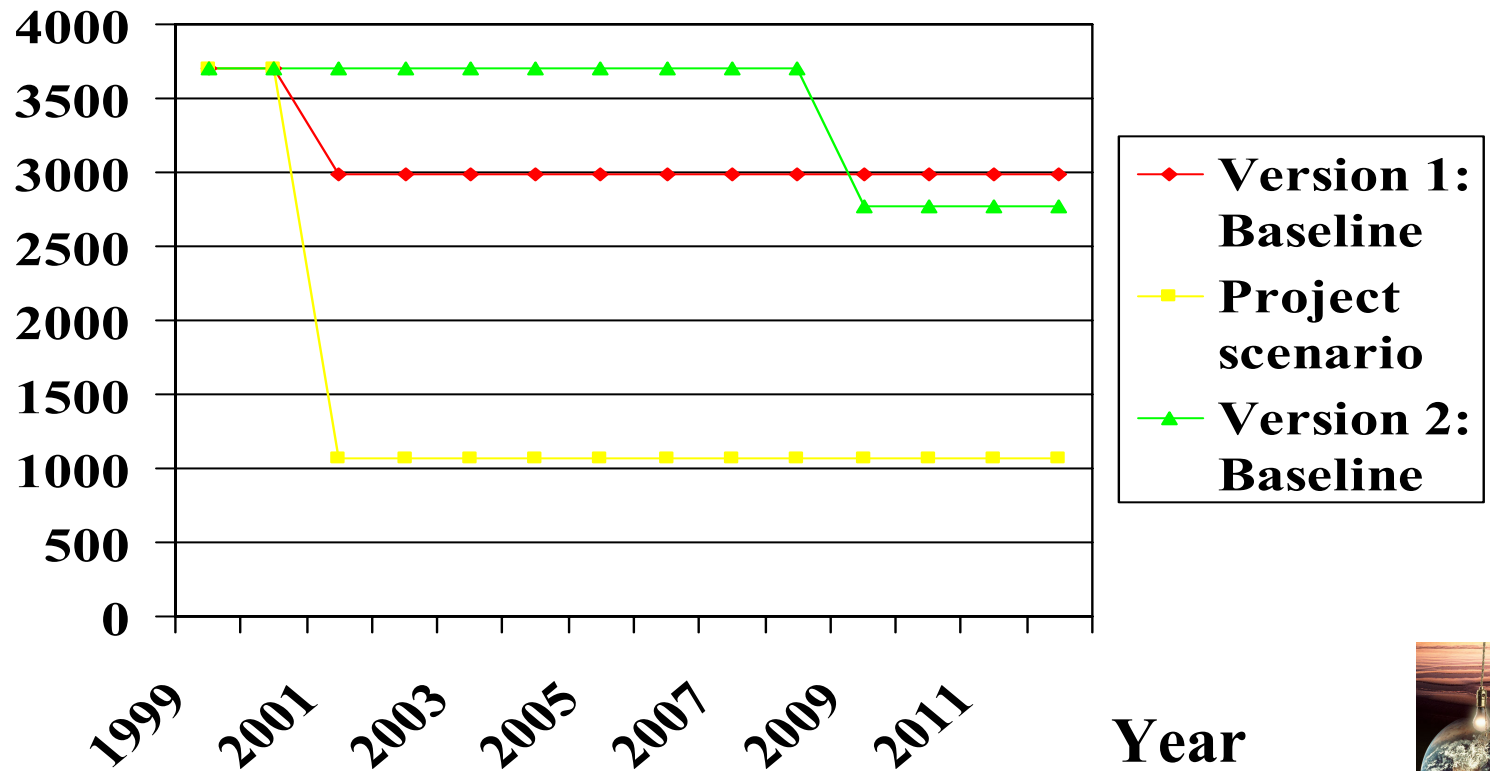
Reference Case (emissions w/out project)

- project emissions



Case Study Result: Version 1 & 2

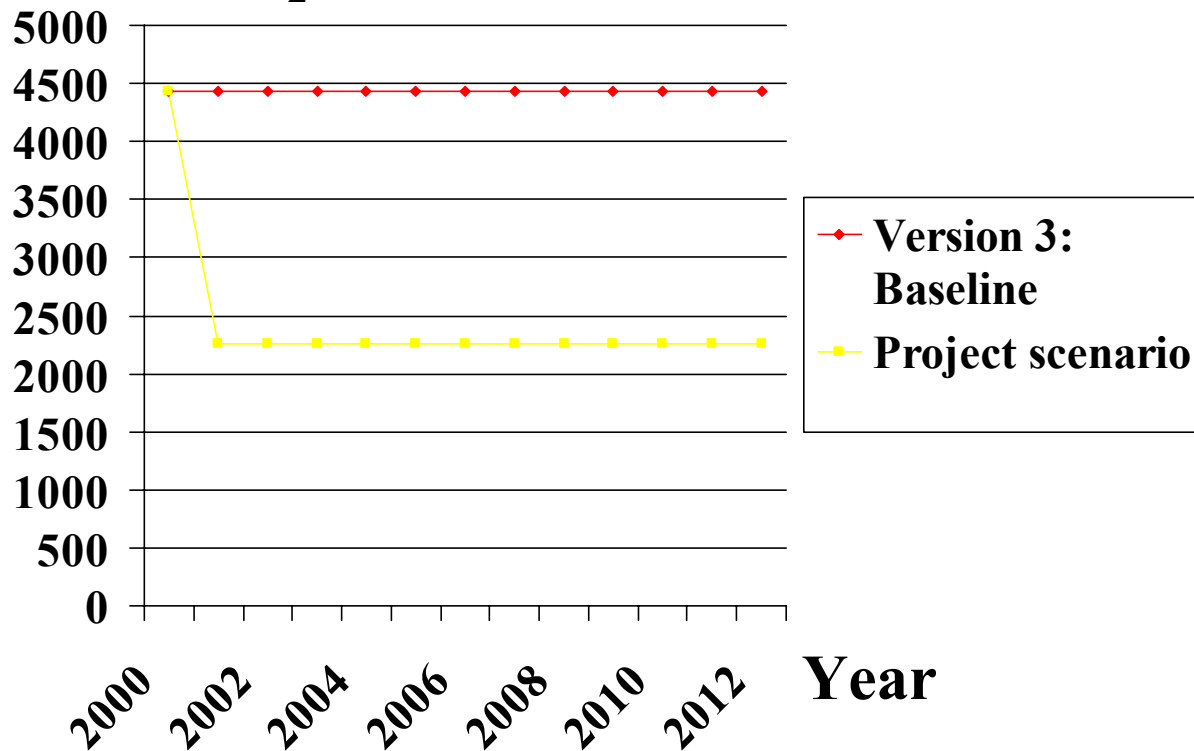
Metric t CO₂



Case Study: Version 3

- Full fuel cycle analysis

Metric t CO₂



Conclusion

- Co-operative Mechanisms
 - Improve environmental performance
 - Spur technology transfer
 - Address economics
- Project developers should:
 - Use detailed baselines, w/out compromising costs
 - Ensure additionality

